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OPENING THE BLACK BOX OF FIRM PERFORMANCE: THE ROLE OF CEO'S EDUCATION

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Abstract

The distribution of firm performance is much dispersed. Rational behind it is still not fully understood. According to upper echelon theory, top managers' personal characteristics determine firm-level performance. In the spotlight of research is the role of education, which is often referred as proxy for human capital. I provide evidence that firms managed by CEO with MBA degree are on average 5-7 percentage points more productive. Meanwhile, prestige of education is not important. Cross-sectional dataset combining 18 European countries and 15 sectors allows accounting for unobservables at country-sector level. I also address the gap in the literature by analyzing the impact of different types of education. Evidence suggests that the engineering degree is probably the worse option for CEO. Juridical background has limited positive impact on firm performance. Education in economics, finance, accounting, marketing, or fine arts has no effect.

Keywords: Firm performance, CEO, Educational background

JEL: G34, J24, I23

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Contents

1 Introduction

Over the last two decades economists have turned to the problem of heterogeneity of performance among firms. Many studies pointed to the significant scale of productivity dispersion, which takes place both in developing and developed economies. Syverson (2004b) on the sample of U.S manufacturing industries showed that a plant at 90th percentile of productivity distribution is almost twice more productive than one at 10th percentile. Hsieh and Klenow (2009) found that ratio to be five to one in China and India.

Little (1962), Geroski and Gugler (2004) pointed to fat-tailed distribution of firm growth rate. Further studies (Stanley et al., 1996; Bottazzi et al., 2001) reveal tent-shaped (log-Laplace) distribution. The heterogeneity on firm level is at the basis of "new new" trade theory. For example, Helpman, Melitz and Yeaple (2004) created model, according to which within-sector firm productivity differences explain the structure of international trade and foreign direct investment. They provided supporting evidence from 52 sectors across 38 countries.

The reasons behind heterogeneity of performance are not yet fully understood. Upper echelon theory gives one of possible explanations. The upper echelon is defined as key decision-making group that stands between firm and its environment. Hambrick and Mason (1984) stated that top managers' background characteristics determine organizational outcomes, namely strategic choices and performance. Later studies, such as Bertrand and Schoar (2003), confirmed predictions of theory. The role of management practices was underlined, for example, by Bloom and Van Reenen (2007), Bushnell and Wolfram (2009).

Present research follows the upper echelon theory. Chief executive officers (CEOs) are on the top of firm's organizational hierarchy. Usually they are those who have to makes efforts for increasing of financial and market performance. The objective is to reveal the impact of CEO's educational background, which is one of key personal characteristics. The direction of its influence on firm performance is not obvious.

On the one hand, level of education is often treated in literature as a good proxy for human capital, knowledge, or intellectual abilities. Better educated CEO is supposed to be more intelligent and is better able to operate with information (Hambrick and Mason, 1984). According to Hitt and Tyler (1991) and Wally and Baum (1994) such manager has better cognitive abilities and since could faster absorb and accept new ideas. He or she is open to changes and therefore ready to employ novel managerial practices and even drastically change corporative strategy (Wiersema and Bantel, 1992). Bantel and Jackson (1989) found that better educated CEOs are also more involved in implementing technical innovations and tend to invest more in R&D activities.

On the other hand, unobserved personal characteristics, as leadership, charisma

or entrepreneurial skills, could as well affect overall firm performance. For example, Bhagat et al. (2010) pointed that top managers are selected because of their higher abilities. According to these authors, abilities consist of "observable and quantifiable characteristics such as education and work experience, as well as unobservable and potentially non-quantifiable characteristics". Darmadi (2013) states that "fast-growing and high-performing firms were founded and are managed by people who are not highly-educated". Because of the presence of unobservable characteristics, which are much difficult to measure, the impact of observable ones (e.g. education or experience) is not obvious.

Existing studies provide contradictory results concerning relationship between CEO's educational background and firm-level performance. One could distinguish two competing branches of literature. At least four studies argue that education of CEO does influence performance. Jalbert et al. (2002) employ a sample consisting of Forbes 800 U.S. firms and find that the prestige of CEO's graduate school positively influences return on assets (ROA). However, they get contradictory results while testing the relationship between graduate degree and performance. It is significantly positive for performance measured basing on Tobin's Q and negative for return on assets (ROA).

Kong and Zhang (2010) studied interacting and feedback effects between human capital and performance on the sample of publicly listed Chinese companies. They investigated the effect and efficiency of managerial human capital within different firm-ownership structures. They found that senior manager's educational level generates a positive effect on the firm's operating and market performance. Dominant state control diminishes this contribution margin. However, the existence of powerful large minority shareholders has a positive effect.

Cheng et al. (2010) hypothesize that management demography of CEO is important and reflects valuable resources of the firm. They examined 5339 firm-year observations of listed Chinese firms. It was found that various management demographic characteristics (level of education, titles, age and tenure) of chairpersons significantly influence corporate performance. These findings suggest that personal attributes of the chairperson are appropriate proxies of human resources and managerial networking competencies.

Darmadi (2013) provides evidence from Indonesia that the educational qualifications of board members and CEO matter, to a particular extent, for either return on assets (accounting-based performance) or Tobin's Q (market-based performance). For example, CEOs holding degrees from prestigious universities perform significantly better than those without such qualifications.

There are at least three studies where results suggest that there is no relationship between CEO's education and firm performance. For example, Gottesman and Morey (2010) on the sample of 390 U.S. firms examined both type of education and selectivity

of schools from which CEOs have graduated. They found that educational background of the CEO is not related to financial performance. Firms managed by CEOs with MBA perform no differently than ones with CEOs who hold undergraduate non-liberal arts, law or liberal arts undergraduate degrees. Simultaneously, firms headed by CEOs from more selective schools perform no better than ones with CEOs from less selective schools.

Bhagat et al. (2010) employed much larger sample of 14500 CEO-years corresponding to largest 1500 U.S. firms. They fail to find any significant relationship between CEO's education and long-term firm performance. They concluded that education is not a good proxy for abilities. However, they provide empirical evidence that hiring new CEOs with MBA degree leads to short-term improvements in performance. Their results suggest that while education background appears to play an important role for hiring of CEOs, it does not affect performance in the long run.

Lindorff and Jonson (2013) studied the relationship between business education of CEOs of top 200 Australian companies and their firm's performance. They proved the absence of relationship between CEO's MBA, business, or other qualification and firm financial performance.

Present study contributes to the debate around the relationship between educational background of CEO and performance of firms. I employ diverse cross-sectional sample that encompasses 18 European countries. Manager-firm matched sample includes 5127 active firms, which operate in 15 sectors defined according to NACE Rev. 2 classification. I contribute upon existing literature as all of studies are executed basing on one-country sample, which is usually the set of U.S firms.

The firm-level performance is measured by eight productivity ratios, namely return on assets (ROA), return on equity (ROE), return on capital employed (ROCE), earnings before interest and tax (EBIT) margin and earnings before interest, taxes, depreciation and amortization (EBITDA) margin. Barnes (1987) underlined that financial ratios control for the size of financial information, which ensures comparability among firms.

Gibson (1987) surveyed chartered financial analysts and concluded that at least 90 percent of them treated ROA as a primary measure of performance. Jewell and Mankin (2011) pointed to the existence of 11 different versions of ROA ratio. They concluded that ROA calculated basing on net income is the most common, but other versions could have a valid use in the proper context. Hence, I include ROA, ROE and ROCE calculated basing on both net income and profit (loss) before tax.

Performance distribution in the final sample is found to be notably skewed (Figure 1). This fact is consistent with results in literature and confirms large heterogeneity among firms. There could be an issue of matching between most productive firms and best educated candidates for CEO position. I apply t-test and find high probability of endogenous matching for three of eight alternative dependent variables. They are

excluded from further analysis.

I define four categories of CEO's educational background according to two criteria: holding of MBA degree and the prestige of attended institution. Firms headed by CEOs without such qualifications are included in base group. The impact of MBA and prestigious education is evaluated using OLS approach. The set of controls consists of demographic characteristics of managers, firm-level financial characteristics and ownership variables. Present study is the first in this direction of literature to account for unobservable variables that could influence performance at country-sector level. Corresponding fixed effect dummies are included in specifications.

Highlighted research question is closely related to the real life problem of selection for the position of CEO. As was noticed by Gottesnan and Morey (2010) "shareholders and prospective investors are in constant search of capable managers who will increase firm value. One of the few CEO characteristics that is publicly available is the CEO's educational background".

Several studies (e.g. Mintzberg, 2004; Pfeffer and Fond, 2002) underline that MBA education seems to be irrelevant to practical tasks that managers have to deal with in real business environment. Rynes et al. (2003) found that business schools emphasize too much abstract theories and don't put enough attention to improving practical skills. Bennis and O'Toole (2005) as well as Hambrick (2007) figure out that business schools are more focused on research education, rather than practical management. Further criticism is related to weakness in developing innovative or risk-taking skills. Finkelstein and Hambrick (1996) pointed that MBA programs stimulate students for risk-averse behavior by accentuating methods of avoiding possible losses.

Despite mentioned alarming findings, MBA education is viewed by companies as the desired background. According to GMAC Corporate Recruiters Survey Report (2013), 75 percent of firms in 2013 had plans to hire MBAs. This figure augmented from 62 percent in 2010. MBA qualification is appreciated by employers due to professional network, international outlook, and soft skills developed during studies.

Education of the candidate for CEO's position remains an important selection criterion. This is proved, for example, by statistics of Gilreath Consultantcy, which provides CEO hiring assistance for middle market private equity investors. Its head, Jim Gilreath, points that "Undergraduate degree plus ideally an MBA always verified. Proven experience can mitigate this but over the long haul; CEOs without a degree haven't made the cut in 95% of our searches".

Present research advocates that MBA is the effective way to train top managers. Results suggest that such degree obtained by CEO contributes to the increase of performance on average by 5-7 percent. This result should be interpreted as change in performance in comparison to the base group. Impact of MBA degree on return on equity is found to be at least twice stronger than the one on other measures of perfor-

mance. Shareholders should prefer to hire candidates with such qualification.

Meanwhile, firms led by managers graduated from prestigious institutions don't show better performance. Such result could be explained by experience effect. Social contacts and practical skills obtained during the carrier could overcome influence of education. Miller at al. (2014) concluded that graduation from an Ivy League affects performance at early stages of CEO's careers. Later on, competition with better trained peers supplemented by experience leads to mitigation of the impact of formal education.

Hitt and Tyler (1991) pointed that the type of education could determine choice of corporative strategic decision models. However, there is still very limited number of studies which investigate impact of different majors of education followed by top managers. Present research contributes to the literature by addressing this issue. Impact of CEO's education in economics, finance, accounting, marketing, engineering, law and fine arts is analyzed. Results suggest that firm led by CEOs with engineering diploma performs significantly worse. Juridical education has limited positive impact. All other mentioned kinds of educational background generally don't influence performance.

The rest of the paper is organized as follows. In Section 2, the dataset is introduced. I present empirical strategy and hypotheses in Section 3. Results are reported in Section 4. Section 5 provides robustness checks. Finally, Section 6 summarizes obtained results.

2 Data

Present research is conducted basing on the cross-sectional firm-level dataset for 2012. Data is extracted from Bureau van Dijk Amadeus database. The broad sample consists of 5127 active firms chosen according to the availability of the information about chief executive officer. There are 6080 CEOs, which exceeds the number of companies because for some of them there is more than one CEO. In such firms two or more people share functions of chief executive.

Further individual characteristics of CEOs are associated with firms. In case of absence of such data I omit company from the sample. If a firm has multiple CEOs, the first one with full available information is included. Final sample contains around 500 observations. The size of sample varies from one specification to another and depends on the choice of dependent variable. Descriptive statistics are reported in Table 1.

2.1 Dependent variable

Dependent variable across all specifications is the firm performance. Five alternative measures are applied: (1) return on assets (ROA), (2) return on equity (ROE), (3) return

on capital employed (ROCE), (4) earnings before interest and tax (EBIT) margin and (5) earnings before interest, taxes, depreciation and amortization (EBITDA) margin. ROA, ROE and ROCE are each calculated basing on either net income or profit (loss) before tax. Consequently, final sample includes eight alternative dependent variables. Their definitions alongside with formulas are reported in Table 2.

Return on assets (ROA) is a financial ratio calculated as percentage of net income or profit (loss) before tax in total assets. The higher the ROA, the more money company is making with less capital investment. Negative ROA indicates that the firm is investing a high amount of capital into its production simultaneously receiving little income.

Return on equity (ROE) is the amount of net income or profit (loss) before tax returned as a percentage of shareholders equity. It measures how much profit firm generates with the money shareholders have invested. Negative values of this financial ratio are an alarming signal for investors. In such case the firm is rather losing, than gaining the value. It typically happens at the beginning of corporative life cycle due to significant capital expenditures. Economic downturns and recessions could negatively affect ROE though reduction of demand.

Return on capital employed (ROCE) is a financial ratio that measures efficiency with which capital is employed. It is calculated by dividing either net income or profit (loss) before tax by employed capital. Higher values refer to more efficient use of capital. The main difference from return on equity is that ROCE considers not only common equity, but also debt and other liabilities. This indicator better reflects performance of firms with significant debt.

Earnings before interest and tax (EBIT) margin is equal to total operating earnings before taking into account interest payments and income taxes divided by operating sales. This ratio is a very rough approximation for cash flow from operations (CFO). Negative EBIT margin means that sales are inferior to fixed costs. That could be typical case at the early stage of corporative growth or shortly after the launch of a major new product line.

Similar indicator of performance is earnings before interest, taxes, depreciation and amortization (EBITDA) margin. Comparing to EBIT margin, this indicator doesn't consider effects of financial and accounting decisions. EBITDA margin is equal to earnings before interest, tax, depreciation and amortization divided by operating sales.

2.2 Explanatory variables

The first group of independent variables, which is in the focus of interest, reflects the education of chief executive officer. Dummy for MBA degree is equal to 1 if the manager has MBA degree and to zero otherwise. Approximately 10 percent of chief executives in the final sample have such qualification. There are four dummies which

measure the prestige of education. First, institutions are being viewed as more prestigious if they belong to some high strata of schools.

IvyLeagueGrad dummy equals to one if manager holds an undergraduate or graduate degree from one of institutions participating in Ivy League. The schools united under this label are among the most selective in the World. They admit each year the most outstanding students basing on academic merits and social achievements.

The selection is also organized basing on results of SAT, GRE and GMAT tests. Their higher scores are understood as an indicator of remarkable intelligence. Ivy League universities have long-lasting reputation for exceptional quality of education. Only 6.3 percent of CEOs in the sample are graduated from such institution.

European analogue to Ivy League is the cohort of French "Grande Ecole" institutions. Strict entrance conditions and high quality of training are common to them. Therefore graduation from such school could be interpreted as signal of higher abilities. GrandeEcoleGrad is the dummy which is equal to 1 if CEO has graduated from school belonging to that group. There are approximately 7.5 percent of such managers in the sample.

The second way to define the prestige of education is to consider the place of an institution in the global ranking. Top25ARWU dummy is equal to one if manager graduated from university that was rated in 2011 among top 25 universities in the Academic Ranking of World Universities. For the purpose of robustness check dummy Top25QS is introduced. It reflects whether the institution belonged in 2011 to the group of top 25 universities according to methodology of Quacquarelli Symonds. It should be noted that Top25ARWU and Top25QS dummies are correlated by 87.27 percent. Around 12 percent of CEOs have obtained degree from top 25 world universities.

I introduce seven dummy variables indicating different academic majors: economics, finance, accounting, marketing, engineering, law and fine arts. Each of them is equal to one if CEO has obtained corresponding undergraduate or graduate degree. In the sample there are tree dominating types of educational background: engineering (23 percent), economics (21 percent) and fine arts (21 percent). Degree in accounting is held by 9.6 percent of managers. Diploma in law and finance were obtained by 3.6 and 2.7 percent of CEOs respectively. Only 7 managers (1.3 percent) have degree in marketing.

Second set of independent variables consists of CEO's demographic characteristics. They are caught by age and gender. Gender is reflected by dummy Male, which equals to 1 if CEO is male and to zero otherwise. Around 93 percent of chief executive officers are males. Kalleberg and Leicht (1991) hypothesize that male executives are more likely to manage in better way due to their higher propensity to innovate. Dezsö and Ross (2012) and Lam et al. (2012) concluded about absence of relationship between female CEOs and firm performance.

However, recent empirical studies prove that firms led by female CEOs outperform ones with male executives. Davis et al. (2010) showed that SMEs managed by women perform significantly better because of their stronger market orientation. Khan and Vieito (2013) executed study on panel of US firms between 1992 and 2004. They concluded that the firm risk level is smaller when CEO is female. Peni (2014) points to the positive relationship between presence of female CEOs or Chairs and firm performance.

Another demographic variable controlled for is the age. The mean age in the final sample is 54 years. Berry et al. (2000) found similar CEO's average age, which is 56.7 years. Palia and Ravid (2002) estimated it to be 57.5 years. Lucier et al. (2003) showed that newly appointed CEOs are on average 50 years old.

Results in the literature on the relationship between firm-level productivity and age are ambiguous. For example, Thomas and Peyrefitte (1996) found positive impact of CEO's age on performance. Jalbert et al. (2002) concluded about absence of any relationship. Hambrick and Mason (1984) claim that younger CEOs are less conservative. Similarly, Bertrand and Schoar (2003) stated that older CEOs are more conservative, which could have both positive and negative impact.

At the same time, according to learning theory older CEOs have less physical and mental strength needed for acquisition of ideas and implementation of new strategies. MacCrimmon and Wehrung (1986), Sundaram and Yermak (2007) found evidence that older CEOs are more risk-averse. Dechow and Sloan (1991) put forward the horizon problem, according to which CEOs at the age near retirement take efforts to maximize current performance. For example, such managers reduce R&D expenditures in order to preserve their personal salaries and benefits from decline. Gibbons and Murphy (1992) claim that older managers focus on short-terms projects. However, Hirshleifer (1993) found that youngest CEOs follow similar strategy in order to gain reputation.

Third group of independent variables consists of two ownership indicators. Dummy ShareholderCEO is equal to one is CEO holds any of corporate shares and to zero otherwise. This is possible in two cases: (1) CEO serves also as the chair of the board of directors or (2) CEO receives equity-based compensation. In the sample approximately 5.5 percent of chief executives have status of shareholder. The limitation of analysis is that the construction of dataset doesn't allow distinguishing CEO duality and stock-based incentive plans.

Dummy for majority shareholder is equal to 1 if one shareholder has more than fifty percent of the total mass of outstanding shares and to zero otherwise. Big proportion (76 percent) of firms in sample is controlled by majority shareholder. According to expropriation hypothesis of Shleifer and Vishny (1997) "as ownership gets beyond a certain point, the large owners gain nearly full control and prefer to use firms to generate private benefits of control that are not shared by minority shareholders". Morck

et al. (1988) found an inverse U-shaped relationship between firm value and ownership. Thomsen et al. (2006) concluded about a negative effect of majority ownership. However, Demsetz and Lehn (1985) and Demsetz and Villalonga (2001) found no statistically significant relationship between performance and the presence of major shareholder.

The last group of independent variables combines firm-level controls. Logarithm of sales is introduced as the proxy for firm's size. There are many studies arguing that firm performance is affected by size. Gooding and Wagner (1985) executed meta-analysis of 31 studies of the size-performance relationship. They found that size and productivity measured in absolute terms were positively related to each other. However, this relationship was not revealed for performance measured in relative (output-input) terms. Later studies, for example, Kenyon and Mathur (1998), Darmadi (2011) found positive impact of size.

The other control is the firm's age. It is equal to number of years from the year of incorporation until 2012. The average firm in the sample was established around 26 years ago. Batra (1999) and Kroszner (2000) pointed to the presence of link between age and performance. According to life cycle theory, older firms are less flexible to changes and since should perform worse than younger ones. Sorenson and Stuart (1999) found empirical evidence that relatively new firms perform better. Meanwhile, Majiundar (1997) employed the sample of 1020 Indian firms and found that older ones are more productive and less profitable. Coad et al. (2013) studied impact of firm age to performance on a panel of Spanish manufacturing enterprises. They concluded that older firms have better productivity, higher profits, larger size, lower debt ratios, and higher equity ratios. The explanation is that more mature companies are more capable to convert growth of sales into growth of profits and productivity.

Gearing is an important financial characteristic that influences performance. It is equal to total debt divided by total equity. This is measure of financial leverage and is defined as the degree to which firm's activities are funded by owner's funds comparing to creditor's funds. Stulz (1990) developed model predicting that debt can have both positive and negative effects on firm performance. Opler and Titman (1994) concluded that more leveraged firms demonstrate less performance during periods of downturns. Margaritis and Psillaki (2010) found support for agency cost hypothesis formulated by Jensen and Meckling (1976), according to which higher leverage is associated with improved efficiency.

Another important factor that influences firm-level performance is the liquidity. The most popular traditional measures of corporate liquidity are current ratio and quick ratio. In present study the current ratio is implied, which is the measure of the ability of the firm to convert assets into cash. It is equal to current assets divided by current liabilities.

3 Empirical strategy

The aim of research is to assess the impact of CEO's education on firm-level performance. In Section 2 three groups of educational variables were described. I put forward two hypotheses related to relationship between dependent variables and variables of interest.

The graduates from more prestigious institutions and ones having MBA degree should demonstrate superior abilities and deeper knowledge. There are two reasons. First, such schools are high-selective and choose prospective students according to social and academic achievements, results of tests for intellectual abilities. Business schools also require certain amount of practical experience. Second, the quality of received training is higher, which is proved by excellent reputation of institutions. Specific trait of MBA academic program is the combination of analytical and quantitative training with developing of communication skills. Case studies and internships are essential part of educational process.

Alumni of both MBA programs and most prestigious schools have more of social capital. This advantage is related to network linkages acquired during studies. CEOs with MBA degree have larger and more diverse professional networks. Burt (1992) and Belliveau et al. (1996) concluded that CEOs graduated from high selective institutions have more connections to politicians and government servants. It allows them to gain governmental contracts and lobby more favorable taxation, which results in better performance. Pérez-González (2006) proved such prediction and pointed that firms led by CEOs without Ivy League undergraduate degree demonstrate worse performance.

According to human capital theory, personal skills, which could be improved through education, are the source of economic productivity (Becker, 1964). Upper echelon theory (Hambrick and Mason, 1984) states that superior abilities of CEOs positively influence firm-level outcomes. Consequently, I formulate two hypotheses concerning background of CEO:

Hypothesis 1: MBA education has positive impact on firm performance.

Hypothesis 2: More prestigious education leads to better firm performance.

Both hypotheses are tested together within same regression models by applying ordinary least squares (OLS) estimation method. There could be four categories of educational background. Most commonly CEO doesn't have MBA nor graduated from prestigious university. Totally opposite case is when he or she has simultaneously MBA degree and prestigious diploma. The last two categories refer to situations where CEO either got MBA or graduated from one of prestigious institutions. Three categorical dummies are included in regressions. The base group is the one consisting of firms led by CEOs without MBA and having not prestigious degree.

Before proceeding to testing hypotheses, the issue of endogenous matching should

be accounted for. There could be matching between best productive firms and best educated candidates for the position of chief executive officer. It could occur if firm prefers to hire CEO with MBA degree or more prestigious diploma. Better performing firm is likely to offer superior incentives. Meanwhile better educated candidate could choose the firm according to some other criteria. For example, Kramarz and Thesmar (2013) underlined important role of networking for appointment decisions. Endogenous matching is also not much realistic due to the asymmetry of business information.

The endogenous matching for each of eight alternative dependent variables is tested by applying the t-test. Final sample was divided into two groups according to the value of educational variable of interest. The first test is executed for MBA dummy taken as the measure of education. If the prospective CEO doesn't have MBA degree, the firm belongs to the first group and to the second one otherwise. In case of endogenous matching the mean performance at the year of CEO's appointment would be greater in the first group. The same principle of testing is applied for dummies related to the prestige of degree.

Results of tests for endogenous matching are further applied to the choice of dependent variables. For five of eight dependent variables the absence of such issue is proved. I consequently regress ROA (Net income), ROA (P/L before tax), ROE (Net income), EBIT margin and EBITDA margin on educational variables, controlling for demography of CEO, ownership and characteristics of firms. Demography of CEOs is kept by gender and age. Ownership is controlled by introducing dummies for CEO being shareholder and for the presence of majority shareholder. Firm characteristics are kept by firm's age, logarithm of sales, gearing, current ratio and its square.

The reason behind inclusion of current ratio both in linear and quadratic forms is that the U-shape of relationship between performance and current ratio is supposed to hold. Richards and Laughlin (1980) argue that investors should focus on two things at same time: (1) avoiding default situations by emphasizing firm's ability to cover its obligation with cash flow under normal conditions and (2) keeping operating cash flows sensitive to incidences of decrease of sales and earnings. Firms with fewer current assets will have problems with continuing their operations. Meanwhile, too big current assets are the signal that the return on investment is not in perfect condition (Horne and Wachowicz, 2000).

Unobservable country-specific and (or) sector-specific characteristics could be correlated with included explanatory variables. Therefore omitted variable bias could prevent getting correct estimations. Gottesnan and Morey (2010) controlled for sector-specific fixed effects. They gave example that MBA skills are less appropriate for managing of the pharmaceutical company than of the bank.

I consequentially include in regressions country fixed effects, sector fixed effects and country-fixed effects. The latter ones mean that unobservable characteristics spe-

cific to concrete sector in concrete county are taken into account. Firms in the final sample represent 18 European countries and 15 sectors. Sector is defined according to NACE Rev. 2 statistical classification of economic activities.

There is concern that firms with unusual pattern of correlation between performance and gearing or performance and current ratio could influence results of estimations. These companies are of two types: (1) ones having huge gearing or current ratio and (2) ones showing extremely high or low performance alongside with gearing or current ratio close to zero.

Observations that significantly outstand from others are called outliers. In order to detect them I apply blocked adaptive computationally efficient outlier nominators (BACON). This method was introduced for the first time by Billor et al. (2000). I employ the first version of identification procedure, which is based on Mahalanobis distances. Outliers are (1) 5 percent of the farthest points for correlation of performance with current ratio and (2) 1 percent of the farthest points for correlation with gearing.

Estimated equations could be represented in following general form:

$$\begin{aligned} PERF_i &= \beta_0 + \beta_1 \cdot MBA_i + \beta_2 \cdot Prestige_i + \beta_3 \cdot MBAPrestige_i + \gamma_1 \cdot D_i' + \gamma_2 \cdot O_i' + \\ &+ \gamma_3 \cdot F_i' + \nu \cdot \delta_{ci} \cdot \delta_{si} + \varepsilon_i \end{aligned}$$

Coefficients of interests are β_1, β_2 and β_3. They correspond to impact of CEO's MBA degree, prestigious education and MBA from prestigious schools on firm performance $PERF_i$. I introduce demographic, ownership and firm-level controls denoted by vectors D_i', O_i' and F_i'. Country and sector fixed effect dummies are δ_{ci} and δ_{si}, respectively.

The impact of different majors of CEO's education on firm performance is tested by regressing each of eight dependent variables on dummies for education in economics, finance, accounting, marketing, engineering, law and fine arts. In additional to the main set of controls I include in regressions IvyLeagueGrad dummy.

Robustness checks are executed by testing the impact of alternative measures of prestige of education. First, instead of IvyLeagueGrad, I employ GrandeEcoleGrad dummy. Dummy MBAGrandeEcole corresponds to the case where CEO that graduated from French Grand Ecole also possesses MBA degree. The effect of MBA or more prestigious education is estimated in comparison to the case of absence of such degrees. Another robustness check is done by accounting for the position in QS ranking instead of the one in ARWU.

Second, the impact of alternatively defined CEO's education is tested. I regress dependent variables on MBA and IvyLeagueGrad included separately. Furthermore, the effect of business degrees other than MBA is investigated. Additionally, I expand the list of Ivy League institutions by Stanford and University of Chicago and compare results with ones for Ivy League.

4 Results

The issue of endogenous matching is the first thing to be addressed before proceeding to further analysis. As was discussed in Section 3, the t-test is applied for that purpose. The principle is to divide sample into two sub-groups according to the meaning of educational variables. The preliminary stage of testing consists of two-group variance-comparison test that allows identifying whether variances of two sub-groups are equal or not. At the second stage t-test is applied taking into account equal or unequal variance. Three alternative hypotheses about difference between performances of two sub-groups are tested. Hypothesis of interest is that the difference between average performance of group of firms with better educated CEOs and the one with lower educated managers is below zero.

Results of testing for endogenous matching are reported in Table 3. First, the alternative hypothesis of interest for MBA dummy is significant in three of eight cases. More precisely, it is significant at five percent level while taking ROE (P/L before tax) and ROCE (P/L before tax) as measures of performance. Lower statistical significance is observed for ROCE calculated basing on net profit. As the concern of endogenous matching is high for these dependent variables, they are excluded from analysis while testing hypotheses 1 and 2.

The same method is applied for testing for possible matching between more productive firms and manager graduated from universities belonging to Ivy League. As it is reported in Table 3b, none of alternative hypotheses are significant. On average performance of firms where CEOs with more prestigious diploma were hired, was the same as of ones which employed CEOs without such diploma. This result is confirmed in case of defining prestigious education as graduation from one of top 25 institutions according to Academic Ranking of World Universities.

Another important step to be taken before applying OLS method is to detect outliers. Employed procedure is discussed in Section 3. In further discussion results for unrestricted samples with outliers are compared to results obtained after removing outliers. Figures 2-6 report correlations between five dependent variables and two important financial indicators. There are 28 different firms that were identified as outliers. It should be noted that only two of them are led by CEOs with MBA qualification. Outliers are marked graphically with crosses (X).

The graphs underwritten by letter "a" refer to correlation with current ratio. There are 14 firms marked as outliers and almost all of them (13) show high values of current ratio. Four of these companies operate in the sector of financial and insurance activities. Information and communication sector as well as professional, scientific and technical activities are represented by three firms each. These sectors largely employ intangible assets.

The graphs under letter "b" report correlation between different measures of firm performance and gearing. There are 14 firms marked as outliers. Abnormally high values of gearing, which is the proxy for financial leverage, are shown by 6 of them. Three of these companies operate in the sector of wholesale and retail trade. They participate in the final steps of distribution of merchandise goods.

The results of testing Hypotheses 1 and 2 are represented in Tables 4a and 4b. As it was discussed in Section 3, there could be four categories of educational background. Coefficients of three categorical dummies are reported. The analysis is based on comparison with performance of firms led by CEOs which don't have MBA nor prestigious degree.

According to Table 4a, CEO's MBA degree from non - Ivy League university improves performance by 4-16 percentage points. After removing outliers the effect becomes less dispersed: from 4.21 to 12.6 percentage points. It should be noted that the magnitude of impact is more than twice bigger for return on shareholders' equity comparing to other dependent variables. Shareholders' decision to hire CEO having MBA is the right way to improve pay-off of their investments.

Overall the impact of MBA education along is found to be statistically significant. For ROA and ROE the coefficient is significant at 5 percent level. The effect on EBITDA margin is stronger with significance at 1 percent level. At the same time, there is weak impact on EBIT margin, which is significant only for non-restricted sample. The difference between these two measures is in capital expenditures.

The impact of IvyLeagueGrad dummy on EBITDA margin is around 6 percentage points and is significant at 5 percent level. That magnitude is similar to the effect of MBA. However, this result is not robust to the change of definition of performance. For all other alternative dependent variables the effect is not statistically different from zero. It means that firms led by CEOs having diploma from one of Ivy League institutions don't show significantly better results. This is true even for chief executives who supplementary possess MBA degree.

The definition of more prestigious education as graduation from one of American Ivy League institutions could be disputable. The alternative approach is to define more prestigious university as the one belonging to top 25 of ARWU ranking. Table 4b reports similar OLS estimations. The significance of MBA degree is exactly the same as in Table 4a. However, the magnitude of its impact is higher. It is from 4.24-16.4 percentage points for non-restricted sample to 4.51-12.8 for specifications without outliers. The graduation from one of top 25 universities in the World seems to have positive, but still not significant impact.

The impact of different types of educational background is tested by consequent regressing of all eight dependent variables on dummies for education in economics, finance, accounting, marketing, engineering, law and fine arts. For each type OLS

approach is applied both on non-restricted samples and after removing outliers. The set of controls is described in Section 2 and is the same across all specifications. The additional control variable is the IvyLeagueGrad, which is included to catch the prestige of education. I introduce country-sector fixed effects to account for unobservable characteristics. OLS coefficients are reported in Table 5.

The impact of education in economics or marketing is imprecise, large standard errors are observed in many cases. However, their coefficients are positive for six of eight dependent variables. This result is consistent with Buyl et al. (2011). Their explanation revolves around better intra-board communications established by CEO with background in marketing, which tends to share ideas and coordinate efforts. Coefficient of dummy for finance, on the contrary, has mainly negative sign, but is as well not statistically different from zero.

CEO's education in engineering is found to likely detriment the corporative performance. Its coefficient becomes significant for three of eight dependent variables after removing outliers. Existing studies (Datta and Guthrie, 1994; Finkelstein and Hambrick, 1996; Barker and Mueller, 2002) suggest that CEOs with technical education devote more financial resources to R&D activities. Steensma (1998) concluded that top executives with technical education have more comprehensive understanding of technologies and innovations.

Many studies (e.g. Kim and Lyn, 1990; Lichtenberg and Siegel, 1991) advocate that R&D investments pay off in improved productivity. On the other hand, more recent researches point to limitations of such conclusion. Morbey (1988) showed strong impact of R&D spendings on further growth in sales. However, he found weak correlation between R&D intensity and growth in profitability. García-Manjón and Romero-Merino (2012) concluded that only high-technology firms obtain clear benefits from their R&D investment.

The way how R&D resources are managed is more important for productivity than the absolute or relative level of technological investment. CEOs with engineering background are more prone to invest in R&D, but could lack of skills and experience required for successful managing of financial flows. Financial skills are more common to CEOs with MBA degrees. Graham and Harvey (2002) found that managers with such qualification more frequently follow academic advice and employ present value techniques for evaluation of new projects.

Goh et al. (2008) reported that absolute majority of technical undergraduate and postgraduate programs are not adapted to needs of management. They suggest transformation of engineering education. First, financial skills should be introduced into undergraduate programs as an elective. Second, team-related and communication skills should be practiced throughout technical courses. Third, at post-graduate level the management skills need to be taught in the context of particular industry.

Strictly positive effect is demonstrated by juridical background. However, it is weakly significant only for two dependent variables. Dummy for law is not robust to removing outliers. The effect could be driven by firms having high financial leverage. CEO with education in law could be more efficient in more indebted firms. Such manager better knows how to oppose to the interests of creditors through juridical channels.

Tables 4a and 4b report exclusively OLS estimations for coefficients of interest. Meanwhile, the direction of impact of control variables could contribute to understanding of determinants of firm-level performance. Detailed OLS results are represented in Appendix A. The construction of regression tables is identical. In first two columns results with country fixed effects are represented. In next two columns sector fixed effects are included. In the last two columns I report results for regressions with country-sector fixed effects. In all tables specifications in columns number 2, 4 and 6 are given for sub-samples obtained from initial sample after exclusion of BACON outliers.

The first group of controls combines demographic characteristics of chief executives. The age of CEO, which is the proxy for experience, influences performance positively. Female managers are found to be better than their male collogues. This result is consistent with recent findings of Davis et al. (2010), Khan and Vieito (2013) and Peni (2014). It should be noted that both demographic variables are not statistically significant and since much weight can't be given to such result.

Ceteris paribus corporative performance is 4.52-10.3 percentage points lower in the presence of majority shareholder, which owns at least 50 percent of shares. This could be explained by information asymmetry between majority and minority shareholders. According to expropriation-of-minority-shareholders hypothesis, top management of such firm puts in place strategies that increase the wealth of majority to the prejudice of minority. Confirming that mentioned theory results are obtained by Bange and De Bondt (1998), Bushee (1998), Kim and Yi (2006).

Besides the effect of the presence of majority shareholder I investigate the impact of CEO's possession of corporative shares. This could occur in case of implementation of equity-based long term incentive plans and compensation packages. Such measures were recognized in the literature to play important role in mitigation of the conflict of interests between managers and shareholders. For example, Ozkan (2011) found positive impact of equity-based CEO compensation on firm performance. Meanwhile, she points to the decrease of the effect with longer CEO tenure. Yermack (1995) noticed that such type of compensation could contribute to overcoming of the horizon problem. Dechow and Sloan (1991) defined it as willingness of CEOs of near retirement age maximize their current compensation by implementing of risky projects with higher short-term performance.

At the same time, CEO could be shareholder in case of duality, when he or she is also the chair of the board of directors. According to agency theory, CEO duality could decrease firm performance due to undermining of monitoring and control function of the board (Jensen, 1993; Daily and Dalton, 1994; Davidson et al., 2004). Meanwhile, unification of command functions and higher accountability in corporate leadership possibly leads to positive impact (Donaldson and Davis, 1991; Brickley et al., 1997; Bhagat and Black, 2001). Significant at-risk wealth of CEOs leads to higher motivation for manager to put efforts for maximization of shareholders' wealth (Jensen and Murphy, 1990).

I found limited evidence that firm performance worsens if its CEO possesses corporative shares. ShareholderCEO dummy has negative sign in most cases. However, it is significant only in the specifications with ROE (net income) and EBITDA margin as dependent variables. Unfortunately, construction of employed sample doesn't permit to distinguish observations with equity-based compensations from ones with CEO duality. However, the overall negative sign of ShareholderCEO could be interpreted the prevalence of the negative impact of CEO duality over positive one of equity-based compensation schemes.

The last group of controls consists of firm-level characteristics. The impact of age of company is found to be ambiguous and not significant. Coefficient that corresponds to logarithm of sales, which is proxy for size, is significant at 5 percent level only if performance is measured as EBITDA margin. Gearing impacts performance strongly negatively with significance in majority of specifications at 1 percent level. As gearing is proxy for financial leverage, more indebted firms demonstrate less financial productivity.

Coefficients of current ratio and squared current ratio have opposite signs for all five alternative dependent variables. Results suggest U-shape functional form of relationship between firm performance measured as return on equity and current ratio. That means that the highest performance is shown by those companies, which hold either very low or very high amounts of liquid assets. Relationship with EBIT and EBITDA margins is close to inverted U-shape. In this case firms with medium ability to pay back short-term obligations are the most productive ones.

5 Robustness checks

Represented in Section 4 results suggest that CEO's MBA education is an important factor that positively influences performance of firms. The objective of this section is to test the result by accessing alternative categories of educational background. The GrandEcoleGrad dummy is employed in alternative to IvyLeagueGrad. Further the position in Quacquarelli Symonds (QS) ranking is taken instead of one in ARWU rank-

ing. Results of robustness checks are reported in Appendix B.

Coefficients in columns 1 and 2 of Table B1 represent OLS estimations of the impact of MBA education. They should be compared to ones in columns 1 and 2 of Table 4a. The change of definition of prestigious group of institutions doesn't affect the significance of coefficients for MBA degree along. Approximately same magnitude is observed. Other types of education (columns 3-6) are not significant, similarly to main results. The only one difference is that MBA from Grande Ecole becomes significant for three dependent variables after removing BACON outliers.

Second robustness check is executed by replacing Top25ARWU with Top25QS dummy. In the sample there are no CEOs with MBA degree from top 25 universities according to QS ranking. Coefficients of MBA are smaller in magnitude, comparing to ones in columns 1 and 2 of Table 4b, but are significant at exactly same levels. Therefore absence of statistical significance was confirmed for CEO's prestigious education.

Results of further robustness checks are reported in Table B2. I regress dependent variables on MBA and IvyLeagueGrad separately. Corresponding coefficients are represented in columns 1-2 and 7-8. CEO's MBA degree holds positive sign, but becomes less significant. The IveLeagueGrad is confirmed to have no impact on firm-level performance. Following Miller et al. (2014), I define "Expanded Ivy" list by including Stanford and University of Chicago. In all specifications I control for the same set of CEO demographic and firm characteristics as in the main analysis.

Alternative definitions of business education are also included in robustness checks. In columns 3-4 of Table B2 I list coefficients corresponding to the effect of non-MBA business degrees. They are negative, but not statistically different from zero. While defining business education as either MBA or another business-oriented major, I obtain positive and not significant effect on firm performance. Therefore MBA degree is more relevant than other business-related educational programs.

6 Conclusion

Paper addresses the role of chief executive officer's educational background in determining firm-level performance. The impact of four different types of CEO's education is studied. The base type is the non-MBA degree delivered by not prestigious institution. The impact of other types on firm-level performance is estimated in comparison to that baseline educational background.

MBA degree from not prestigious institution is found to have positive and significant impact on firm performance. The firm led by CEO who obtained such degree performs on average 5-7 percentage points better than those with CEO having baseline education. Corresponding coefficient is significant in most cases at 5 percent level. The explanation behind it is in diverse training received by MBA students. They ac-

quire both analytical and practical skills that are essential for corporative management. CEO with such degree also has broader professional network.

MBA degree has approximately twice stronger impact on return on equity, comparing to other measures of performance. In that case shareholders would expect better return from their investments. They should implement in practice such result by hiring candidate with MBA for the position of CEO. Present research contributes to the debate in literature around effectiveness of business education.

More prestigious education of CEO is found to have no impact on performance. Same is observed for MBA delivered by prestigious schools. This result is consistent with findings of Gottesman and Morey (2010). Their explanation could be called "effort effect". Graduates of less prestigious institutions are initially discriminated. They have to work harder and longer to obtain the same post. An appointment as CEO signals that their performance capabilities are recognized to be at least at the level of peers with more prestigious diploma.

There could be an alternative explanation related to experience and networking effects. Initially alumni of prestigious schools have advantages due to the fact of being pre-selected, among other things, according to the level of intelligence. Further they receive superior training. However, manager starts to acquire social capital (network linkages) and applied skills since the beginning of career. At some point formal prestige education becomes no more the key factor determining performance of managed firm.

The impact of different academic majors is also investigated. CEO's engineering education is found to have negative effect on firm performance. Possible explanation is that engineering educational programs don't contribute to developing of financial and soft skills. There is limited evidence that firms with CEO having degree in law show better performance. Effect becomes insignificant after removing outliers, which means that it could be driven by firms having high financial leverage. Possible reasoning behind positive effect for indebted firms is that CEO with juridical background could better know how to oppose interests of creditors in favor of corporation. Academic majors in economics, finance, accounting, marketing and fines arts are found to be not significant.

The limitation of present research is related to employed dataset. The sample doesn't allow controlling for network effects. Meanwhile, they are declared in the literature to significantly impact performance. First, networking facilitates direct transfer of information. For example, Hochberg et al. (2007) concluded that venture capital funds with better networks demonstrate significantly better fund performance. Second, social networking also permits to better assess the quality of management. Cohen et al. (2010) found evidence that fund managers make more profit from trading of stocks of firms with which they have social connections. Kramarz and Thesmar (2013) also re-

veal correlation between the network of board of directors and network of CEO, which influences appointment decisions.

Further research should be executed basing on enriched panel dataset. Such construction of sample would allow controlling for unobserved variables that are constant over time. Time dimension is essential for disentangling short-term and long-run effects. Analysis could also be expanded by inclusion of individual-level data on compensation, particularly emphasizing the role of equity-based compensation plans. Similar methodology could be applied for the study of the relationship between educational backgrounds of other top managers and firm performance.

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8 Tables and figures

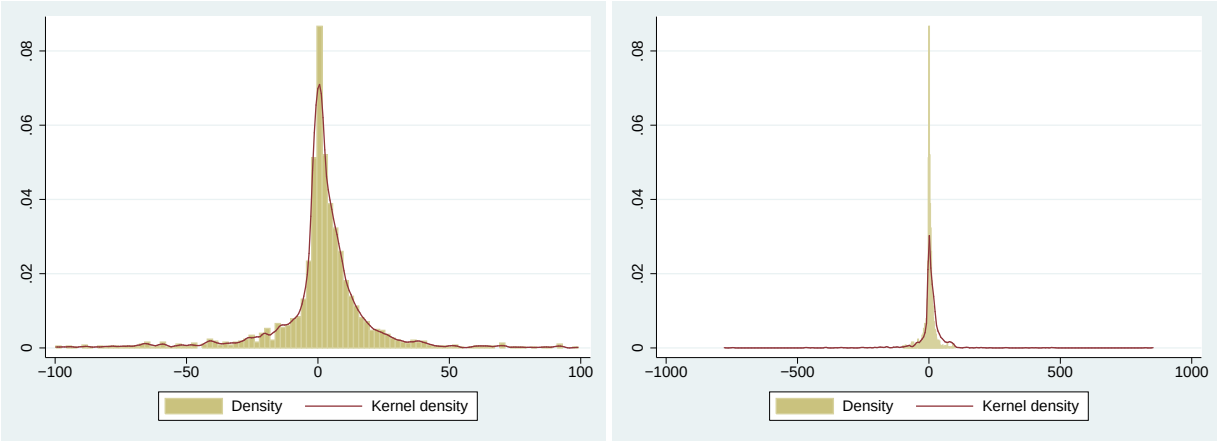
Table 1: Descriptive statistics

	Mean	St. Div.	Min	p25	p50	p75	Max	N
Panel A: Firm performance								
ROA (Net income)	5.24	15.0	-94.9	0	3.83	8.94	98.9	703
ROA (P/L before tax)	7.17	16.1	-94.2	0.82	5.59	12.2	83.2	704
ROE (Net income)	10.3	56.4	-743.7	0	10.0	23.2	290.5	703
ROE (P/L before tax)	19.4	71.0	-738.4	2.03	14.0	34.8	736.3	708
ROCE (Net income)	9.40	25.7	-167.2	1.31	7.68	16.0	145.2	503
ROCE (P/L before tax)	13.8	33.0	-154.6	2.32	9.78	21.7	225.6	508
EBIT margin	7.76	22.2	-95.6	1.09	5.32	11.6	99.9	690
EBITDA margin	11.6	21.3	-88.0	2.98	7.88	16.3	98.9	581
Panel B: Education of CEO								
MBA	0.100	0.30	0	0	0	0	1	522
IvyLeagueGrad	0.063	0.24	0	0	0	0	1	711
Top25ARWU	0.12	0.33	0	0	0	0	1	711
GrandeEcoleGrad	0.15	0.35	0	0	0	0	1	711
top25QS	0.12	0.33	0	0	0	0	1	711
Economics	0.21	0.41	0	0	0	0	1	522
Finance	0.027	0.16	0	0	0	0	1	522
Accounting	0.096	0.29	0	0	0	0	1	522
Marketing	0.013	0.12	0	0	0	0	1	522
Engineering	0.23	0.42	0	0	0	0	1	522
Law	0.036	0.19	0	0	0	0	1	522
Fine Arts	0.21	0.41	0	0	0	0	1	419
Panel C: Demography of CEO								
Age of CEO	54.1	7.15	30	49	54	59	75	711
Male	0.93	0.26	0	1	1	1	1	711
Panel D: Ownership								
ShareholderCEO	0.055	0.23	0	0	0	0	1	711
Majority shareholder	0.76	0.43	0	1	1	1	1	711
Panel E: Firm characteristics								
Firm's age	25.6	25.3	1	10	18	30	191	711
log(Sales)	10.6	3.42	0.70	8.46	10.5	12.9	19.0	711
Gearing	79.2	136.0	0	2.26	26.9	93.6	928.4	711
Current ratio	3.94	8.78	0.010	1.06	1.60	2.87	90.3	711
Current ratio square	92.6	557.0	0.000100	1.12	2.56	8.24	8159.5	711

Table 2: Definitions of dependent variables

Abbreviation	Deciphering	Formula	Definition
ROA (net income)	Return on assets (net income)	$\frac{Net\ Income}{Total\ Assets}$	An indicator which shows how profitable the company is relative to its total assets
ROA (P/L before tax)	Return on assets (P/L before tax)	$\frac{Total\ Profit\ or\ Loss}{Total\ Assets}$	
ROE (net income)	Return on equity (net income)	$\frac{Net\ Income}{Shareholder\ Equity}$	An indicator that measures how much profit a firm generates with the money shareholders have invested
ROE (P/L before tax)	Return on equity (P/L before tax)	$\frac{Total\ Profit\ or\ Loss}{Shareholder\ Equity}$	
EBIT margin	Earnings before interest and tax margin	$\frac{Operating\ earnings\ before\ interest\ and\ tax}{Operating\ sales}$	The measure of a firm's operating profitability
EBITDA margin	Earnings before interest, taxes, depreciation and amortization margin	$\frac{Operating\ earnings\ before\ interest,\ tax,\ depreciation\ and\ amortization}{Operating\ sales}$	
ROCE (net income)	Return on capital employed (net income)	$\frac{Net\ Income}{Capital\ Employed}$	Financial ratio that measures efficiency with which capital is employed
ROCE (P/L before tax)	Return on capital employed (P/L before tax)	$\frac{Total\ Profit\ or\ Loss}{Capital\ Employed}$	

Notes: Table reports definitions and formulas of employed alternatives measures of firm performance.



(a) ROA (net income)

(b) ROE (net income)

(c) ROCE (net income)

(d) EBIT margin

Figure 1: Performance distributions

Table 3a: Testing for endogenous matching for MBA

Dependent variables	MBA degree No	MBA degree Yes	Unequal variance	Ha: diff<0 P(T<t)	Ha: diff !=0 P(|T|>|t|)	Ha: diff>0 P(T>t)
ROA (P/L before tax)	329	28	No	0.333	0.667	0.667
ROA (Net income)	333	27	No	0.370	0.740	0.630
ROE (P/L before tax)	303	26	Yes	**0.022****	**0.043****	0.978
ROE (Net income)	305	26	Yes	0.381	0.763	0.619
ROCE (P/L before tax)	197	15	Yes	**0.050****	0.100	0.950
ROCE (Net income)	197	15	Yes	**0.093***	0.186	0.907
EBIT margin	235	22	No	0.359	0.719	0.641
EBITDA margin	194	16	No	0.157	0.313	0.843

Notes: Firms are divided into two groups according to MBA dummy. Null hypothesis: average performances of two groups are equal at the year of CEO's appointment (diff=0). Three alternative hypotheses are tested. If firms led by CEOs with MBA showed better performance (diff<0), the endogenous matching is likely to occur. *, ** and *** indicate significance at the 10, 5 and 1 percent levels.

Table 3b: Testing for endogenous matching for IvyLeagueGrad

Dependent	IvyLeagueGrad		Unequal	Ha: diff<0	Ha: diff !=0	Ha: diff>0
variables	No	Yes	variance	P(T<t)	P(|T|>|t|)	P(T>t)
ROA (P/L before tax)	383	21	No	0.746	0.508	0.254
ROA (Net income)	390	22	No	0.705	0.591	0.295
ROE (P/L before tax)	356	20	Yes	0.883	0.234	0.117
ROE (Net income)	360	21	Yes	0.880	0.240	0.120
ROCE (P/L before tax)	241	15	Yes	0.878	0.244	0.122
ROCE (Net income)	241	16	Yes	0.884	0.232	0.116
EBIT margin	284	12	Yes	0.817	0.366	0.183
EBITDA margin	224	11	Yes	0.611	0.777	0.389

Notes: Firms are divided into two groups according to IvyLeagueGrad dummy. Null hypothesis: average performances of two groups are equal at the year of CEO's appointment (diff=0). Three alternative hypotheses are tested. If firms led by CEO that graduated from an Ivy League institution performed better (diff<0), the endogenous matching is likely to occur. *, ** and *** indicate significance at the 10, 5 and 1 percent levels.

Table 3c: Testing for endogenous matching for GrandeEcoleGrad

Dependent	GrandeEcoleGrad		Unequal	Ha: diff<0	Ha: diff !=0	Ha: diff>0
variables	No	Yes	variance	P(T<t)	P(|T|>|t|)	P(T>t)
ROA (P/L before tax)	338	66	Yes	0.908	0.184	**0.092***
ROA (Net income)	341	71	Yes	0.623	0.754	0.377
ROE (P/L before tax)	317	59	No	0.791	0.418	0.209
ROE (Net income)	321	60	Yes	0.876	0.248	0.124
ROCE (P/L before tax)	213	43	Yes	0.850	0.300	0.150
ROCE (Net income)	214	43	Yes	0.878	0.244	0.122
EBIT margin	253	43	Yes	0.124	0.249	0.876
EBITDA margin	202	33	Yes	**0.055****	0.110	0.945

Notes: Firms are divided into two groups according to GrandeEcoleGrad dummy. Null hypothesis: average performances of two groups are equal at the year of CEO's appointment (diff=0). Three alternative hypotheses are tested. If firms led by CEO that graduated from a French Grand Ecole perform better (diff<0), the endogenous matching is likely to occur. *, ** and *** indicate significance at the 10, 5 and 1 percent levels.

Table 3d: Testing for endogenous matching for Top25ARWU

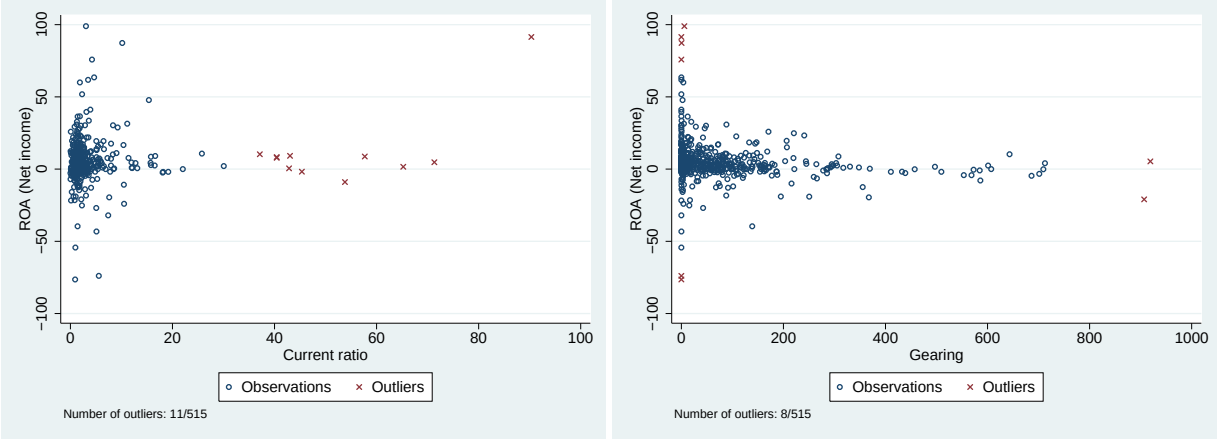
Dependent	Top25ARWU		Unequal	Ha: diff<0	Ha: diff !=0	Ha: diff>0
variables	No	Yes	variance	P(T<t)	P(|T|>|t|)	P(T>t)
ROA (P/L before tax)	352	52	No	0.331	0.662	0.669
ROA (Net income)	360	52	Yes	0.475	0.951	0.525
ROE (P/L before tax)	330	46	Yes	0.120	0.240	0.880
ROE (Net income)	334	47	Yes	**0.096***	0.193	0.904
ROCE (P/L before tax)	219	37	No	0.725	0.549	0.275
ROCE (Net income)	219	38	Yes	0.350	0.701	0.650
EBIT margin	259	37	No	0.681	0.639	0.320
EBITDA margin	201	34	No	0.581	0.838	0.419

Notes: Firms are divided into two groups according to Top25ARWU dummy. Null hypothesis: average performances of two groups are equal at the year of CEO's appointment (diff=0). Three alternative hypotheses are tested. If firms led by alumni of top 25 world's universities performed better (diff<0), the endogenous matching is likely to occur. *, ** and *** indicate significance at the 10, 5 and 1 percent levels.

Table 3e: Testing for endogenous matching for Top25QS

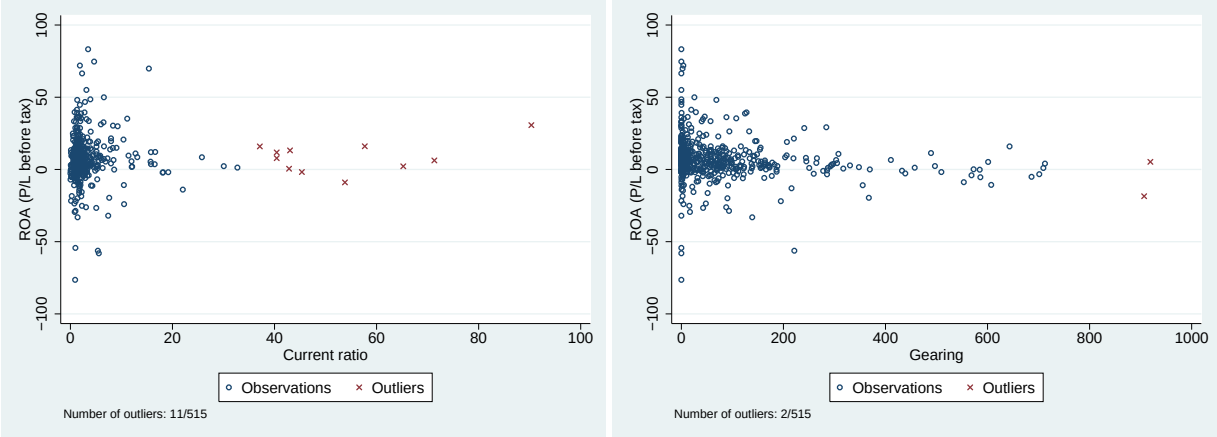
Dependent variables	Top25QS No	Top25QS Yes	Unequal variance	Ha: diff<0 P(T<t)	Ha: diff !=0 P(|T|>|t|)	Ha: diff>0 P(T>t)
ROA (P/L before tax)	356	48	Yes	0.712	0.576	0.288
ROA (Net income)	363	49	Yes	0.721	0.556	0.278
ROE (P/L before tax)	332	44	Yes	0.259	0.518	0.741
ROE (Net income)	336	45	Yes	0.468	0.937	0.532
ROCE (P/L before tax)	222	34	Yes	0.735	0.530	0.265
ROCE (Net income)	222	35	No	0.796	0.409	0.204
EBIT margin	263	33	No	0.774	0.452	0.226
EBITDA margin	205	30	No	0.702	0.597	0.298

Notes: Firms are divided into two groups according to Top25QS dummy. Null hypothesis: average performances of two groups are equal at the year of CEO's appointment (diff=0). Three alternative hypotheses are tested. If firms led by alumni of top 25 world's universities performed better (diff<0), the endogenous matching is likely to occur. *, ** and *** indicate significance at the 10, 5 and 1 percent levels.



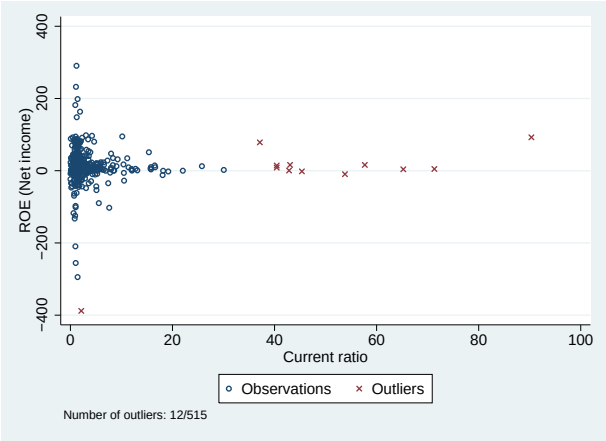
(a) ROA and current ratio (b) ROA and gearing

Figure 2: Correlations for ROA (net income)

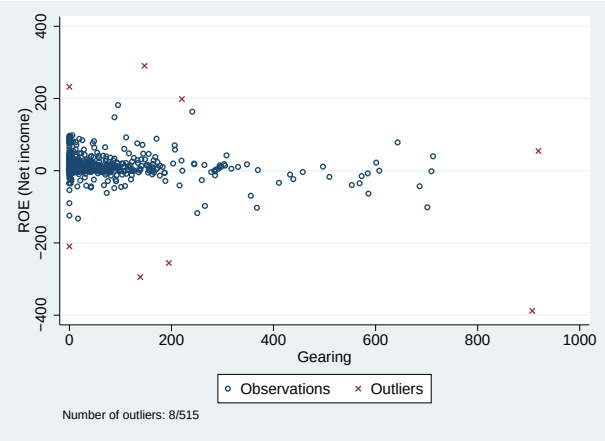


(a) ROA and current ratio (b) ROA and gearing

Figure 3: Correlations for ROA (P/L before tax)

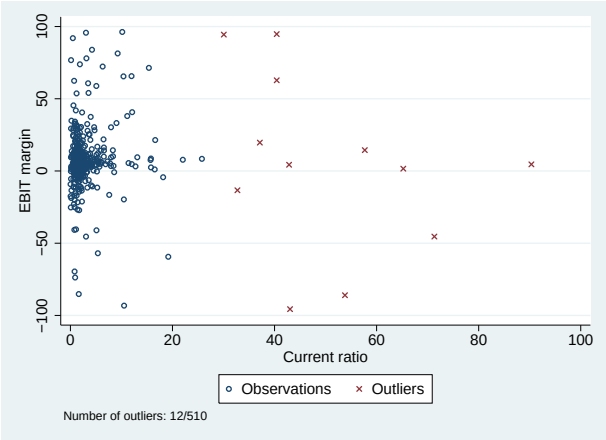


(a) ROE and current ratio

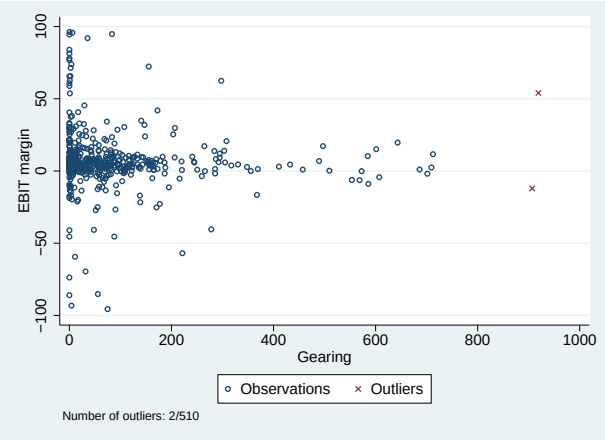


(b) ROE and gearing

Figure 4: Correlations for ROE (net income)

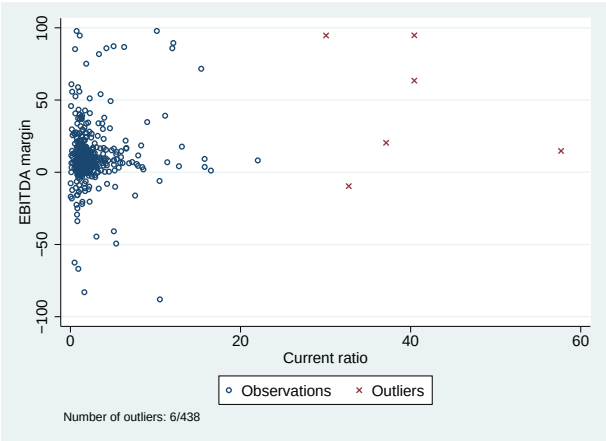


(a) EBIT margin and current ratio

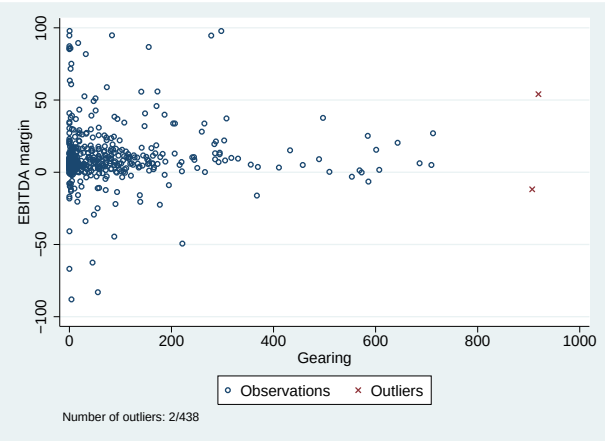


(b) EBIT margin and gearing

Figure 5: Correlations for EBIT margin



(a) EBITDA margin and current ratio



(b) EBITDA margin and gearing

Figure 6: Correlations for EBITDA margin

Table 4a: Impact of CEO's education on firm performance

Dependent variables	MBA		IvyLeagueGrad		MBAIvyLeague	
	(1)	(2)	(3)	(4)	(5)	(6)
ROA (Net income)	3.99**	4.21**	-1.19	-1.92	1.72	2.01
	(1.70)	(1.67)	(1.82)	(1.68)	(4.39)	(4.26)
ROA (P/L before tax)	5.13**	5.40**	0.46	0.24	2.85	2.28
	(2.26)	(2.29)	(2.14)	(2.14)	(4.88)	(4.87)
ROE (Net income)	16.3**	12.6**	0.87	-3.00	-14.4	-21.8*
	(7.65)	(5.21)	(5.98)	(5.53)	(16.7)	(11.2)
EBIT margin	5.08*	4.52	3.51	2.43	2.99	2.78
	(2.93)	(3.07)	(2.33)	(2.29)	(4.05)	(4.04)
EBITDA margin	7.28***	6.88***	6.10**	5.98**	-1.34	-1.56
	(2.40)	(2.43)	(2.91)	(2.91)	(4.36)	(4.39)
Removed outliers		yes		yes		yes
Country-sector FE	yes	yes	yes	yes	yes	yes

Notes: Table reports OLS estimates for impact of CEO's education on firm performance. Prestigious institution is one belonging to Ivy League. Each row corresponds to one of alternative dependent variables. Typical set of controls (CEO's demography, ownership, firm characteristics) is included to all specifications. Robust standard errors are reported in parentheses. *, ** and *** indicate significance at the 10, 5 and 1 percent levels.

Table 4b: Impact of CEO's education on firm performance

Dependent variables	MBA		Top25ARWU		MBATop25ARWU	
	(1)	(2)	(3)	(4)	(5)	(6)
ROA (Net income)	4.24**	4.51***	1.49	1.47	-0.37	-0.51
	(1.76)	(1.73)	(1.95)	(1.82)	(4.76)	(4.66)
ROA (P/L before tax)	5.50**	5.74**	3.62	3.42	0.40	0.18
	(2.34)	(2.37)	(2.34)	(2.42)	(5.39)	(5.41)
ROE (Net income)	16.4**	12.8**	2.61	-0.87	-5.20	-12.8
	(7.84)	(5.44)	(5.44)	(4.48)	(19.9)	(15.6)
EBIT margin	5.55*	5.04	4.91	5.09*	-2.53	-2.59
	(3.03)	(3.17)	(3.06)	(3.03)	(5.75)	(5.31)
EBITDA margin	7.57***	7.23***	4.74*	5.34**	-4.61	-5.00
	(2.47)	(2.49)	(2.55)	(2.54)	(6.11)	(5.98)
Removed outliers		yes		yes		yes
Country-sector FE	yes	yes	yes	yes	yes	yes

Notes: Table reports OLS estimates for impact of CEO's education on firm performance. Prestigious institution is one belonging to top 25 in ARWU. Each row corresponds to one of alternative dependent variables. Typical set of controls (CEO's demography, ownership, firm characteristics) is included to all specifications. Robust standard errors are reported in parentheses. *, ** and *** indicate significance at the 10, 5 and 1 percent levels.

Table 5: Impact of different types of CEO's educational background on firm performance

Dependent variables	Economics		Finance		Accounting		Marketing		Engineering		Law		Fines arts	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
ROA (Net income)	2.12	**1.94***	-1.90	-1.85	-1.55	-1.96	-1.18	-1.74	-2.14	**-2.25***	**10.6***	5.92	0.53	0.64
	(2.31)	**(1.12)**	(1.88)	(1.83)	(2.12)	(2.08)	(2.83)	(2.46)	(1.40)	**(1.27)**	**(5.67)**	(4.18)	(2.04)	(1.78)
ROA (P/L before tax)	-0.28	-0.39	0.39	0.13	-2.55	-3.33	2.62	3.00	-2.18	-2.50	8.72	8.39	1.68	1.53
	(1.88)	(1.91)	(2.94)	(2.94)	(3.08)	(3.15)	(4.09)	(3.99)	(1.54)	(1.57)	(5.58)	(5.88)	(2.66)	(2.70)
ROE (Net income)	3.16	1.03	-6.99	-10.7	1.78	-1.03	-4.04	**-12.6***	-4.08	-3.87	28.9	6.44	10.1	3.59
	(5.37)	(4.48)	(11.5)	(8.89)	(9.42)	(3.88)	(9.03)	**(7.40)**	(5.78)	(3.81)	(17.7)	(8.07)	(7.95)	(5.99)
ROE (P/L before tax)	0.25	2.38	0.26	-1.46	-7.08	-14.2	9.26	18.2	-1.26	**-12.8****	**29.9***	27.1	22.7	1.20
	(7.63)	(6.44)	(13.3)	(11.3)	(12.0)	(9.86)	(24.4)	(20.2)	(10.1)	**(5.69)**	**(17.8)**	(17.0)	(17.8)	(8.57)
ROCE (Net income)	-2.84	-2.87	-6.12	-5.85	4.68	3.21	7.55	6.60	-7.01	**-7.64***	15.6	16.4	2.75	2.89
	(4.32)	(4.34)	(10.4)	(10.1)	(5.59)	(5.59)	(8.86)	(8.85)	(4.28)	**(4.29)**	(9.53)	(10.9)	(4.89)	(5.06)
ROCE (P/L before tax)	0.48	2.49	-12.1	-12.1	6.19	5.19	5.51	0.89	-4.99	-3.18	14.8	11.6	5.79	6.19
	(3.75)	(2.73)	(9.96)	(9.39)	(7.75)	(7.92)	(8.55)	(7.31)	(3.43)	(2.61)	(9.35)	(11.4)	(6.86)	(7.05)
EBIT margin	0.84	1.58	-0.37	-0.40	-1.26	-3.43	2.49	2.90	1.05	-0.41	8.14	7.00	-0.75	-2.59
	(2.88)	(2.53)	(2.53)	(2.36)	(3.67)	(3.61)	(6.06)	(5.38)	(2.13)	(2.05)	(7.30)	(7.23)	(3.14)	(3.08)
EBITDA margin	1.73	1.29	2.81	2.26	-2.93	-3.45	1.58	1.60	-1.34	-1.74	7.63	10.2	-0.67	-1.04
	(2.50)	(2.50)	(2.90)	(2.86)	(4.52)	(4.50)	(5.63)	(5.35)	(2.42)	(2.37)	(8.11)	(8.55)	(3.39)	(3.53)
Removed outliers		yes		yes		yes		yes		yes		yes		yes
Country-sector FE	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

Notes: Table reports OLS estimates for impact of different majors of CEO's education. Each row corresponds to one of alternative dependent variables. Typical set of controls (CEO's demography, ownership, firm characteristics) is included to all specifications. IvyLeagueGrad dummy is supplementary introduced in order to catch the prestige of attended institution. Robust standard errors are reported in parentheses. *, ** and *** indicate significance at the 10, 5 and 1 percent levels.

Appendix A. Detailed OLS results

Table A1: OLS results for return on equity (ROE) calculated basing on net income

	(1)	(2)	(3)	(4)	(5)	(6)
MBA	15.2**	10.7**	18.4**	12.3***	16.3**	12.6**
	(7.07)	(4.58)	(7.32)	(4.69)	(7.65)	(5.21)
IvyLeagueGrad	0.15	-1.83	-0.72	-2.47	0.87	-3.00
	(4.96)	(4.52)	(5.39)	(4.44)	(5.98)	(5.53)
MBAIvyLeague	-11.8	-12.5*	-16.0	-10.3	-14.4	-21.8*
	(9.34)	(6.85)	(10.4)	(6.74)	(16.7)	(11.2)
Age of CEO	0.23	0.049	0.18	0.0099	0.023	-0.21
	(0.22)	(0.20)	(0.21)	(0.19)	(0.28)	(0.23)
Male	-7.90	-4.58	-11.1	-6.93	-8.23	-7.24
	(7.88)	(6.98)	(8.16)	(7.23)	(9.71)	(8.07)
ShareholderCEO	-13.0*	-9.79	-11.0	-9.77	-12.3	-8.95
	(7.36)	(7.11)	(7.12)	(7.01)	(10.1)	(10.0)
Majority shareholder	-10.3*	-7.38*	-8.24	-6.07	-11.1	-8.29
	(5.81)	(4.43)	(5.38)	(4.34)	(7.12)	(5.05)
Firm's age	-0.050	-0.038	-0.019	-0.020	-0.0013	0.025
	(0.063)	(0.052)	(0.062)	(0.049)	(0.077)	(0.059)
log(Sales)	0.53	-0.23	0.065	-0.55	0.26	-0.63
	(0.96)	(0.61)	(0.89)	(0.59)	(1.12)	(0.68)
Gearing	-0.073*	-0.058***	-0.073*	-0.052***	-0.067*	-0.053***
	(0.037)	(0.017)	(0.039)	(0.016)	(0.040)	(0.019)
Current ratio	-1.14**	-1.78	-1.03*	-1.55	-1.06	-2.06
	(0.58)	(1.11)	(0.54)	(1.04)	(0.69)	(1.39)
Current ratio square	0.020***	0.046	0.018**	0.032	0.020**	0.070
	(0.0076)	(0.043)	(0.0073)	(0.046)	(0.0089)	(0.061)
Constant	25.4	49.2***	60.2**	40.1**	-8.04	21.5
	(21.1)	(19.0)	(27.5)	(16.8)	(35.7)	(45.6)
Country fixed effects	yes	yes			yes	yes
Sector fixed effects			yes	yes	yes	yes
Removed outliers		yes		yes		yes
Observations	515	496	515	496	515	496
R^2	0.10	0.092	0.10	0.12	0.21	0.28

Notes: Table reports detailed OLS results. Dependent variable is ROE (Net income). Estimates in columns 2, 4 and 6 are obtained after exclusion of BACON outliers. Robust standard errors are reported in parentheses. *, ** and *** indicate significance at the 10, 5 and 1 percent levels.

Table A2: OLS results for return on assets (ROA) calculated basing on net income

	(1)	(2)	(3)	(4)	(5)	(6)
MBA	3.45**	3.61**	4.25***	4.13***	3.99**	4.21**
	(1.58)	(1.54)	(1.50)	(1.46)	(1.70)	(1.67)
IvyLeagueGrad	-0.50	-1.07	-1.07	-1.49	-1.19	-1.92
	(1.57)	(1.51)	(1.36)	(1.29)	(1.82)	(1.68)
MBAIvyLeague	1.89	1.49	3.16	2.52	1.72	2.01
	(2.77)	(2.56)	(2.32)	(2.21)	(4.39)	(4.26)
Age of CEO	0.059	0.091	0.055	0.088	-0.049	-0.0053
	(0.096)	(0.070)	(0.095)	(0.071)	(0.12)	(0.076)
Male	-0.82	-2.48	-2.19	-3.40	-2.05	-3.60*
	(3.79)	(2.23)	(3.73)	(2.23)	(4.27)	(2.09)
ShareholderCEO	-3.60	-0.24	-2.80	0.51	-3.30	0.95
	(4.04)	(2.24)	(4.06)	(2.17)	(5.70)	(2.66)
Majority shareholder	-2.57	-1.46	-1.96	-1.22	-2.66	-1.82
	(2.11)	(1.51)	(1.97)	(1.43)	(2.47)	(1.69)
Firm's age	0.0047	0.0066	0.0014	0.0040	0.015	0.016
	(0.018)	(0.016)	(0.018)	(0.016)	(0.021)	(0.018)
log(Sales)	-0.11	-0.083	-0.19	-0.14	-0.071	-0.051
	(0.25)	(0.21)	(0.25)	(0.22)	(0.30)	(0.23)
Gearing	-0.015***	-0.015***	-0.016***	-0.016***	-0.013***	-0.013***
	(0.0033)	(0.0029)	(0.0031)	(0.0029)	(0.0036)	(0.0033)
Current ratio	-0.36	0.31	-0.42	0.50	-0.30	0.27
	(0.31)	(0.42)	(0.30)	(0.45)	(0.34)	(0.55)
Current ratio square	0.0095	-0.015	0.010*	-0.031	0.0097	-0.011
	(0.0063)	(0.017)	(0.0061)	(0.023)	(0.0064)	(0.026)
Constant	30.1***	4.18	15.4**	11.1*	-12.0	28.1
	(6.95)	(4.89)	(6.70)	(6.49)	(17.9)	(19.5)
Country fixed effects	yes	yes			yes	yes
Sector fixed effects			yes	yes	yes	yes
Removed outliers		yes		yes		yes
Observations	515	497	515	497	515	497
R^2	0.10	0.11	0.12	0.11	0.26	0.31

Notes: Table reports detailed OLS results. Dependent variable is ROA (Net income). Estimates in columns 2, 4 and 6 are obtained after exclusion of BACON outliers. Robust standard errors are reported in parentheses. *, ** and *** indicate significance at the 10, 5 and 1 percent levels.

Table A3: OLS results for return on assets (ROA) calculated basing on profit (loss) before tax

	(1)	(2)	(3)	(4)	(5)	(6)
MBA	4.75**	4.92**	5.69***	5.74***	5.13**	5.40**
	(2.00)	(2.02)	(1.88)	(1.87)	(2.26)	(2.29)
IvyLeagueGrad	0.64	0.57	0.31	0.16	0.46	0.24
	(1.78)	(1.78)	(1.48)	(1.50)	(2.14)	(2.14)
MBAIvyLeague	2.58	1.86	1.55	1.15	2.85	2.28
	(3.08)	(3.08)	(2.69)	(2.70)	(4.88)	(4.87)
Age of CEO	0.082	0.093	0.067	0.080	-0.0063	-0.0046
	(0.093)	(0.094)	(0.095)	(0.096)	(0.11)	(0.11)
Male	0.13	0.48	-1.19	-0.52	0.40	0.85
	(3.43)	(3.60)	(3.48)	(3.64)	(3.60)	(3.84)
ShareholderCEO	-2.78	-3.14	-1.75	-2.24	-2.48	-2.82
	(4.45)	(4.45)	(4.46)	(4.43)	(5.91)	(5.93)
Majority shareholder	0.045	-0.33	0.56	0.080	0.29	-0.19
	(2.15)	(2.18)	(2.05)	(2.11)	(2.59)	(2.65)
Firm's age	0.013	0.0071	0.021	0.014	0.027	0.019
	(0.018)	(0.018)	(0.019)	(0.019)	(0.023)	(0.023)
log(Sales)	-0.087	-0.049	-0.12	-0.083	0.064	0.11
	(0.26)	(0.26)	(0.27)	(0.28)	(0.31)	(0.31)
Gearing	-0.016***	-0.018***	-0.018***	-0.020***	-0.015***	-0.017***
	(0.0035)	(0.0037)	(0.0035)	(0.0038)	(0.0040)	(0.0043)
Current ratio	-0.089	0.60	-0.050	0.85	0.016	0.75
	(0.20)	(0.50)	(0.21)	(0.52)	(0.24)	(0.58)
Current ratio square	0.0022	-0.030*	0.0014	-0.042*	0.0015	-0.032
	(0.0031)	(0.017)	(0.0032)	(0.022)	(0.0033)	(0.021)
Constant	7.19	4.66	16.7*	14.5	51.1***	-7.90
	(6.29)	(6.51)	(9.71)	(9.65)	(18.2)	(22.3)
Country fixed effects	yes	yes			yes	yes
Sector fixed effects			yes	yes	yes	yes
Removed outliers		yes		yes		yes
Observations	515	502	515	502	515	502
R^2	0.093	0.096	0.075	0.083	0.26	0.26

Notes: Table reports detailed OLS results. Dependent variable is ROA (P/L before tax). Estimates in columns 2, 4 and 6 are obtained after exclusion of BACON outliers. Robust standard errors are reported in parentheses. *, ** and *** indicate significance at the 10, 5 and 1 percent levels.

Table A4: OLS results for earnings before interest, tax, depreciation and amortization (EBITDA) margin

	(1)	(2)	(3)	(4)	(5)	(6)
MBA	5.12**	5.15**	6.07***	6.07***	7.28***	6.88***
	(2.39)	(2.38)	(1.98)	(1.98)	(2.40)	(2.43)
IvyLeagueGrad	5.24**	5.11**	4.53*	4.90**	6.10**	5.98**
	(2.45)	(2.47)	(2.42)	(2.42)	(2.91)	(2.91)
MBAIvyLeague	2.04	1.59	1.33	0.42	-1.34	-1.56
	(4.04)	(4.07)	(3.37)	(3.36)	(4.36)	(4.39)
Age of CEO	0.14	0.13	0.18	0.17	0.046	0.042
	(0.15)	(0.15)	(0.14)	(0.14)	(0.18)	(0.18)
Male	-5.60	-6.29	-6.93	-7.64	-8.36	-8.90
	(4.71)	(4.77)	(4.67)	(4.76)	(5.41)	(5.44)
ShareholderCEO	-6.98	-6.21	-12.0**	-11.0**	-9.19	-8.02
	(5.65)	(5.61)	(5.16)	(5.14)	(6.22)	(6.07)
Majority shareholder	-7.40***	-6.72**	-5.01*	-4.52*	-4.35	-4.44
	(2.65)	(2.64)	(2.65)	(2.61)	(3.15)	(3.16)
Firm's age	-0.043	-0.036	-0.046	-0.039	0.036	0.028
	(0.034)	(0.034)	(0.035)	(0.035)	(0.039)	(0.041)
log(Sales)	1.04**	0.96**	1.08**	1.05**	1.07**	1.21**
	(0.45)	(0.46)	(0.46)	(0.47)	(0.53)	(0.54)
Gearing	0.0071	0.0064	0.0024	0.00066	0.0032	-0.0010
	(0.0080)	(0.0076)	(0.0070)	(0.0062)	(0.0085)	(0.0073)
Current ratio	2.02***	2.21*	1.45**	1.28	1.62**	2.55**
	(0.72)	(1.21)	(0.68)	(1.08)	(0.72)	(1.24)
Current ratio square	-0.025*	-0.061	-0.016	-0.024	-0.026*	-0.091
	(0.014)	(0.064)	(0.015)	(0.060)	(0.014)	(0.065)
Constant	-16.5*	-15.4	-4.69	-2.85	-6.68	-64.2***
	(9.87)	(9.96)	(9.48)	(9.45)	(14.2)	(17.5)
Country fixed effects	yes	yes			yes	yes
Sector fixed effects			yes	yes	yes	yes
Removed outliers		yes		yes		yes
Observations	438	430	438	430	438	430
R^2	0.16	0.12	0.24	0.21	0.48	0.44

Notes: Table reports detailed OLS results. Dependent variable is EBITDA margin. Estimates in columns 2, 4 and 6 are obtained after exclusion of BACON outliers. Robust standard errors are reported in parentheses. *, ** and *** indicate significance at the 10, 5 and 1 percent levels.

Table A5: OLS results for earnings before interest and tax (EBIT) margin

	(1)	(2)	(3)	(4)	(5)	(6)
MBA	4.03	4.50*	3.64	3.62	5.08*	4.52
	(2.93)	(2.72)	(2.46)	(2.40)	(2.93)	(3.07)
IvyLeagueGrad	3.05	2.74	1.02	1.07	3.51	2.43
	(2.03)	(1.96)	(1.90)	(1.92)	(2.33)	(2.29)
MBAIvyLeague	5.45	3.63	5.23	3.93	2.99	2.78
	(4.04)	(3.67)	(3.30)	(3.12)	(4.05)	(4.04)
Age of CEO	0.15	0.14	0.13	0.12	0.048	0.039
	(0.14)	(0.13)	(0.13)	(0.13)	(0.16)	(0.15)
Male	-1.17	-1.61	-2.53	-3.21	-3.07	-3.05
	(4.02)	(3.82)	(3.99)	(3.79)	(4.89)	(4.46)
ShareholderCEO	1.78	1.87	1.94	2.22	2.59	2.44
	(6.35)	(6.21)	(6.77)	(6.60)	(7.60)	(7.34)
Majority shareholder	-3.11	-3.40	-2.38	-2.88	-1.54	-2.71
	(2.89)	(2.74)	(2.73)	(2.52)	(3.30)	(3.25)
Firm's age	-0.017	-0.024	-0.020	-0.031	0.038	0.016
	(0.032)	(0.027)	(0.034)	(0.031)	(0.039)	(0.037)
log(Sales)	-0.00083	-0.011	-0.11	-0.0079	-0.18	0.081
	(0.41)	(0.40)	(0.45)	(0.43)	(0.49)	(0.48)
Gearing	-0.0021	-0.0067	-0.0053	-0.010**	-0.00030	-0.0081
	(0.0068)	(0.0050)	(0.0064)	(0.0049)	(0.0077)	(0.0056)
Current ratio	0.76	2.39**	0.55	2.11**	0.088	2.33**
	(0.65)	(1.01)	(0.61)	(0.99)	(0.60)	(1.13)
Current ratio square	-0.014	-0.11**	-0.011	-0.098*	-0.0054	-0.11*
	(0.0093)	(0.055)	(0.0086)	(0.053)	(0.0084)	(0.063)
Constant	-4.43	-9.96	3.99	2.84	20.0	-151.9***
	(12.4)	(10.9)	(8.87)	(8.54)	(16.8)	(16.6)
Country fixed effects	yes	yes			yes	yes
Sector fixed effects			yes	yes	yes	yes
Removed outliers		yes		yes		yes
Observations	510	496	510	496	510	496
R^2	0.089	0.12	0.088	0.093	0.33	0.31

Notes: Table reports detailed OLS results. Dependent variable is EBIT margin. Estimates in columns 2, 4 and 6 are obtained after exclusion of BACON outliers. Robust standard errors are reported in parentheses. *, ** and *** indicate significance at the 10, 5 and 1 percent levels.

Appendix B. Robustness checks

Table B1: Impact of CEO's education on on firm performance

Dependent variables	GrandeEcoleGrad as measure of prestige						Top25QS as measure of prestige			
	MBA		GrandeEcoleGrad		MBAGrandeEcole		MBA		Top25QS	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
ROA (Net income)	4.34***	4.09**	2.97	-1.23	-5.91	12.5**	4.07**	4.32***	0.68	0.89
	(1.67)	(1.64)	(4.51)	(3.36)	(10.4)	(5.46)	(1.65)	(1.62)	(1.85)	(1.74)
ROA (P/L before tax)	5.27**	5.18**	0.46	-0.44	-2.25	13.2*	5.11**	5.37**	2.31	2.14
	(2.25)	(2.25)	(4.25)	(4.29)	(11.2)	(6.85)	(2.17)	(2.20)	(2.73)	(2.83)
ROE (Net income)	15.3**	11.2**	-10.3	-0.66	14.1	50.2***	15.6**	12.2**	8.08	-1.80
	(7.69)	(5.15)	(14.5)	(6.70)	(34.4)	(12.0)	(7.24)	(5.13)	(8.17)	(4.67)
EBIT margin	4.91*	4.23	9.30	5.60	0.39	18.5**	4.94*	4.40	0.74	1.19
	(2.84)	(2.89)	(6.32)	(6.12)	(12.2)	(7.94)	(2.81)	(2.96)	(2.58)	(2.53)
EBITDA margin							6.78***	6.36***	2.97	3.56
							(2.27)	(2.29)	(2.81)	(2.87)
Removed outliers		yes		yes		yes		yes		yes
Country-sector FE	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

Notes: Table reports OLS estimates for impact of CEO's education on firm performance. Prestigious institution is French "Grande Ecole" (columns 1-6) or an institution belonging to top 25 in QS World University Ranking (columns 7-10). Each row corresponds to one of alternative dependent variables. Typical set of controls (CEO's demography, ownership, firm characteristics) is included to all specifications. Robust standard errors are reported in parentheses. *, ** and *** indicate significance at the 10, 5 and 1 percent levels.

Table B2: Impact of alternatively defined CEO's education on firm performance

Dependent variables	MBA		Business degree		MBA and business		IvyLeagueGrad		Expanded Ivy	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
ROA (Net income)	2.22	2.57*	-1.21	-0.82	0.68	1.08	0.044	-2.33	0.16	-2.05
	(1.55)	(1.51)	(1.76)	(1.59)	(1.25)	(1.15)	(2.19)	(1.67)	(1.96)	(1.52)
ROA (P/L before tax)	3.12	3.46*	-1.30	-1.07	1.18	1.50	-1.33	-1.77	-1.57	-1.96
	(2.02)	(2.03)	(2.31)	(2.33)	(1.59)	(1.61)	(1.94)	(1.93)	(1.78)	(1.77)
ROE (Net income)	6.60	2.77	-2.89	-6.85	2.43	-1.83	0.27	-7.88*	0.25	-6.92*
	(7.53)	(6.13)	(6.35)	(5.10)	(5.45)	(4.25)	(5.52)	(4.10)	(4.93)	(3.74)
ROE (P/L before tax)			-2.64	-4.76	3.06	2.79	3.08	-7.16	0.24	-8.83*
			(8.22)	(7.25)	(6.64)	(6.26)	(8.32)	(5.20)	(7.48)	(4.87)
ROCE (Net income)			-3.20	-3.06	0.82	3.57	-2.55	-4.01	-1.75	-2.92
			(4.24)	(4.06)	(4.31)	(3.45)	(3.55)	(3.35)	(3.17)	(3.02)
ROCE (P/L before tax)			-4.02	-3.64	1.57	4.96	-2.39	-2.61	-2.16	-2.35
			(4.92)	(4.93)	(5.07)	(4.14)	(4.33)	(4.38)	(3.82)	(3.85)
EBITDA margin	3.86*	4.50**	-4.17*	-3.19	-0.19	0.77	0.90	1.08	1.27	1.42
	(2.07)	(2.01)	(2.27)	(2.17)	(1.73)	(1.64)	(3.01)	(3.03)	(2.71)	(2.71)
EBIT margin	1.65	2.42	-0.36	-0.55	0.73	1.12	-0.081	-1.10	0.24	-0.63
	(2.63)	(2.51)	(2.62)	(2.39)	(1.99)	(1.84)	(2.70)	(2.59)	(2.57)	(2.47)
Removed outliers		yes		yes		yes		yes		yes
Country-sector FE	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

Notes: Table reports OLS estimates of alternatively defined CEO's education on firm performance. Coefficients in columns 1-2 and 7-8 reflect the impact of MBA and degree from an Ivy League institution, respectively. Ones for business degrees other than MBA are in columns 3-4. Effect of all types of business education is represented in columns 5-6. Expanded Ivy is equal to 1 if an institution is Stanford or University of Chicago or belongs to Ivy League. Last two columns report impact of such degree on firm performance. Typical set of controls (CEO's demography, ownership, firm characteristics) is included to all specifications. Robust standard errors are reported in parentheses. *, ** and *** indicate significance at the 10, 5 and 1 percent levels.